UNIVERSITI PUTRA MALAYSIA

GROWTH PERFORMANCE, BODY CONFORMATION, CARCASS CHARACTERISTICS AND PALATABILITY OF KEDAH-KELANTAN CATLE AND ITS CROSSES

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GROWTH PERFORMANCE, BODY CONFORMATION, CARCASS CHARACTERISTICS AND PALATABILITY OF KEDAH-KELANTAN CATTLE AND ITS CROSSES

by

Dahlan bin Ismail

A thesis submitted in partial fulfilment of the degree of Master of Science in the Faculty of Veterinary Medicine and Animal Science, Universiti Pertanian Malaysia.

July 1985

This thesis is dedicated to my father Ismail bin Md. Yunos and my mother Allahyarhammah Maimunah bte Yusoff who introduced me to this world .....

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GROWTH PERFORMANCE, BODY CONFORMATION, CARCASS CHARACTERISTICS AND PALATABILITY OF KEDAH-KELANTAN CATTLE AND ITS CROSSES

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July 1985

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The growth performance of 423 heads of male and female Kedah-Kelantan (KK) cattle and its F_1 crosses were recorded from the same grazing management. Comparisons were made between progenies of KK cows sired by straightbred KK, American Brahman (Br), Polled Hereford (Hr), Friesian (Fr) and Jersey (Jy).

The main objectives of this experiment was to evaluate the simplest crossbreeding system of KK cattle by straight cross between KK female and exotic male for the advantage of heterosis in the growth performance, conformation, carcass characteristics and meat palatability in the F_1 generation.

The present result showed that all the F_1 crossbreds heifers and bulls were superior in the growth performance than the

straightbred KK at all ages. All crossbred calves had significantly higher ($P < 0.01$) birth weight than KK. Brahman x KK (BK) calves were the heaviest at birth, followed by Friesian x KK (FK), Hereford x KK (HK) and Jersey x KK (JK), respectively. The overall percent advantage of crossbreds at birth weight over KK was 27.13%. FK was the heaviest at the adjusted 200-day weight, followed by HK, BK, JK and KK respectively. All crossbreds calves were showing better pre-weaning growing ability than the KK. HK showed superiority in post weaning growth performance than the other crossbreds. Ranking of sire breeds by using the slope of regression equation of growth-age lines as the estimate of growth rate, generally showed consistency for the breedtype among years. Under similar management unit and one type of maternal environment, the result showed that breed sire, especially temperate sires, had contributed the main effect on all the growth traits of these calves.

HK showed higher conformation score due to the tendency of the beef breed crosses to fatten at lighter weight than the dairy breed crosses. HK and FK had the longest body, FK was the tallest at wither, BK was the tallest at the hip, KK was the shortest cattle. HK was the shortest among the crossbreds at the hip.

There is evidence for breed difference in the temperament. This study concluded that Bos indicus cattle and crosses (Brahman x KK) were having poor temperament than half-bred cattle (FK, HK and JK).

The result of carcass evaluation concluded that breed of sire had no significant effect on factor associated with dressing percentage but had significant effect ($P < 0.05$) on the carcass weight per day of age (CWDA). All the crossbreds showed higher CWDA than KK in all slaughter weight group. HK showed the highest CWDA and 21 to 44% superior than KK as the animal increases in slaughter weight. Animals sired by beef type (Hr and Br) produced higher percentage of hindquarter than the crosses from dairy type (Fr and Jy). HK showed the biggest ($P < 0.05$) loin eye area in all slaughter weight group.

KK bulls showed lower bone composition and higher lean composition than other breedtype under similar weight group. Fat composition in the carcass of Zebu cattle (KK and BK) was higher than Zebu x temperate cattle.

Comparison of palatability scores between breed type revealed no significant difference but the scores significantly decreased ($P < 0.05$) as the cattle increased in age from 28-month to 40-month. Among breedtypes, FK and BK showed higher shear force values than JK, HK and KK. The present result concluded that ultimate muscle pH of all breedtypes have some effect on the flavour, overall palatability, tenderness and cooking loss.

The best single body measurement for prediction of total lean meat of half carcass was the measurement of heart girth and the best 4 combination of body measurements found were heart

girth, width of loin, flank girth and width of head. Carcass measurements were also used for predictions of total lean meat. The result showed that forequarter weight, loin eye area, meat to bone ratio, carcass length and dressing percentage are the best 5 variables that should be used in the combination.

Abstrak

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian dari keperluan untuk Ijazah Master Sains.

GROWTH PERFORMANCE, BODY CONFORMATION,

CARCASS CHARACTERISTICS AND PALATABILITY OF

KEDAH-KELANTAN CATTLE AND ITS CROSSES

by

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Prestasi tumbesaran 423 ekor lembu Kedah-Kelantan (KK) dan kacukan-kacukannya generasi F_1, jantan dan betina telah direkodkan di bawah sistem ragutan yang sama. Perbandingan dilakukan di antara anak-anak lembu diibukan oleh baka KK dan baka jantannya dari baka-baka tulin KK, American Brahman (Br), Polled Hereford (Hr), Friesian (Fr) dan Jersey (Jy).

Tujuan utama kajian ini ialah untuk menilai sistem kacukan lembu KK betina dengan baka jantan eksotik untuk kebaikan prestasi tumbesaran, conformasi (bentuk), sifat-sifat karkas dan palatabiliti (penerimaan) daging pada anak-anak kacukan generasi F_1.

Keputusan kajian ini menunjukkan kesemua anak-anak lembu kacukan F_1 (jantan dan betina) lebih tinggi prestasi tumbesarannya dari lembu KK tulin. Kesemua anak-anak kacukan menunjukkan berat lahir yang lebih tinggi dari KK ($P < 0.01$). Brahman x KK (BK) ialah yang terberat pada berat lahir diikuti oleh Friesian x KK (FK), Hereford x KK (HK) dan Jersey x KK (JK) berturutan. Keseluruhannya, baka-baka kacukan menunjukkan 27.13% lebih berat dari baka KK tulin pada berat lahir. FK adalah terberat pada berat anggaran 200-hari diikuti pula oleh HK, BK, JK dan KK berturutan. Kesemua anak-anak lembu kacukan menunjukkan kadar tumbesaran sebelum bercerai susu yang lebih baik dari anak lembu KK tulin. HK menunjukkan prestasi tumbesaran selepas bercerai susu yang tertinggi dari baka-baka kacukan lain. Tiap-tiap jenis baka bapa menunjukkan aturan kecerunan persamaan regrasi tumbesar-umur yang seakan-akan serupa bagi tiap-tiap jenis baka yang sama pada tahun-tahun kajian. Di bawah sistem pengurusan yang sama dan satu jenis baka ibu, keputusan menunjukkan baka bapa terutama bapa dari jenis Bos taurus, telah memainkan peranan yang penting terhadap kesan sifat tumbesaran anak-anak lembu ini.

HK menunjukkan 'score' conformasi yang tertinggi kerana keupayaan baka pedaging kacukan menggemuk pada umur yang lebih rendah dari baka kacukan. HK dan FK mempunyai badan yang terpanjang, FK tertinggi di bahu, BK tertinggi di pinggang, KK adalah lembu yang terendah, HK adalah baka kacukan yang terendah di pinggang dan di bahu.

Dari kajian ini juga terdapat bukti menunjukkan perbezaan antara baka di dalam sifat kelakuan (temperament). Kajian ini memutuskan bahawa lembu baka Bos indicus dan kacukannya (BK) menghadapi sifat kelakuan yang kurang terkawal dari lembu baka kacukan separa (FK, HK dan JK).

Keputusan uraikaji karkas menunjukkan baka bapa tidak menunjukkan kesan terhadap faktor-faktor bersangkutan dengan peratus pemotongan, tetapi berkesan ($P < 0.05$) pada berat karkas setiap hari umur (CWDA). Kesemua kacukan menunjukkan CWDA yang lebih tinggi dari KK dalam kesemua kumpulan penyembelihan. HK menunjukkan CWDA yang tertinggi dan lebih tinggi dari KK sebanyak 21 hingga 44% mengikut bertambahnya berat penyembelihan. Lembu yang menggunakan bapa jenis pedaging (Hr dan Br) menghasilkan peratus suku belakang karkas yang lebih tinggi dari bapa jenis tenusu (Fr dan Jy). HK menunjukkan luas daging batang pinang (loin eye area) yang terbesar dalam kesemua kumpulan pemotongan ($P < 0.05$). Baka KK jantan menunjukkan kandungan tulang yang rendah dan kandungan daging yang tinggi dari jenis baka lain dalam kumpulan berat yang sama. Kandungan lemak lembu jenis Bos indicus (KK dan BK) lebih tinggi dari lembu Bos indicus x Bos taurus.

Perbandingan 'score' penerimaan daging (palatability score) antara jenis-jenis baka menunjukkan tidak ada kesan yang nyata tetapi score menurun ($P < 0.05$) apabila umur bertambah dari 28-bulan ke 40-bulan. Di antara jenis baka, FK dan BK menunjukkan daya keliatan (shear force) yang tinggi dari JK, HK dan KK.

Keputusan ini menunjukkan pH otot tercapai (ultimate pH) dari kesemua jenis baka ada mempunyai kesan terhadap rasa, keseluruhan penerimaan daging, kelembutan dan kehilangan berat semasa dimasak.

Ukuran badan yang terbaik untuk persamaan ramalan jumlah daging dari separuh karkas adalah ukuran lilitan dada, dan gabungan 4 ukuran badan yang terbaik ialah lilitan dada, lebar 'loin' lilitan pinggang dan lebar kepala. Ukuran-ukuran karkas juga digunakan untuk persamaan ramalan jumlah daging. Keputusan menunjukkan berat suku belakang, luas daging batang pinang, nisbah daging ke tulang, panjang karkas dan peratus pemotongan adalah 5 variabel terbaik patut digunakan secara gabungan.

CHAPTER I

INTRODUCTION

Beef production in tropical regions of the world is generally low compared to that in temperate zones. Although the developing countries (mostly in the tropical regions) have 70% of the world's cattle and buffalo population but they produce only 34% of the world's beef; thus they have unexploited resources (Jasiorowski, 1976). The bovine meat production from developing countries was only 15.5 million tons in 1982 compared to 31.2 million tons from developed countries (Asian Livestock, 1983). In general, the international beef export and import trade is dominated by the highly developed countries with only Argentina among the developing countries playing an important role on the export side.

In Malaysia, beef production is very low in terms of quantity and quality. The indigenous Kedah-Kelantan cattle are less productive in terms of growth, meat and milk yield. Their population is relatively small and there is currently a shortage of breeding females for multiplication. More than 90% of the cattle producer or rearer are the smallholders. Beef production amongst smallholders is mainly a supplementary activity. The farmer usually keeps one to a few heads of cattle or buffaloes which are integrated with the whole pattern of his cropping system. In 1980, the estimated local production of bovine meat

and consumption is around 13,000 and 20,000 tons, respectively (Anon, 1981). Thus, there is still insufficient production of meat to meet the national requirement.

There is an attempt to increase cattle production in this country but the Government have encountered many constraints. The first constraint is the availability of adequate number of improved genetic stock of cattle. Generally, animals which have evolved in a tropical environment are well adapted to that environment in terms of survival of the species but may not be well adapted in terms of providing optimum quantities of beef. For example, the indigenous Kedah-Kelantan (KK) cattle, although they have survived well in this country in terms of high fertility and total adaptation to the environment, these cattle are very slow in growth. Conversely, temperate breeds which have been evolved principally for beef production in temperate areas and have undergone various selection programmes, may not be well adapted for survival or production in tropical areas. The animals either do not survive or do not breed, or their performance is much poorer here than in their country of origin (Mason and Buvanendran, 1982). Breed development for meat and milk production is not only time consuming but also location specific. There is, therefore, a need for the genetic variability which is available in the indigenous breeds of cattle and in new production to be carefully assessed so that the kind of cattle propagated or developed are suitable for our conditions and environment.

While crossbreeding may have advantages for commercial production, straightbred stocks will be needed for commercial production on operations where crossbreeding is not practical and as source of breeding stock for crossbreeding operations. Little is known about the performance of some of the crossbreds cattle in this country. Baharin (1978) reported that most of the trials conducted at UPM, MARDI, Institut Haiwan and commercial farms do indicate encouraging performance of the crossbreeds. However, most of the estimates are derived from a small sample of data. There is no information concerning the expected performance, carcass characteristics and the acceptability of the carcass of the crossbred in the local market. The availability of the information on the conformation and palatability of local breed and crossbreds cattle under improved pasture condition is also scarce.

Realising the benefits of crossbreeding in beef production in terms of hybrid vigour in F_1 progeny, straight crossing between KK cows and purebred exotic breed bulls will be carried out in this study.

The objectives of this study are: (1) to study the growth performance, body conformation, carcass characteristics and meat palatability of the KK cattle and its crosses; (2) to provide information on temperamental behaviour of these cattle and (3) to develop prediction equations for estimating lean quantity in these cattle based on live body measurements and carcass measurements.

CHAPTER II

REVIEW OF LITERATURE

a) Genetic improvement of beef cattle

There exist two methods for genetic improvement: (1) selection which changes the additive genetic potential and (2) crossbreeding which is based on both additive and non-additive potential of the population. There is no doubt that both methods can and must be used in developing countries. But selection programmes is normally time consuming and requires sound production testing scheme. Genetic improvement through selection programmes for cattle in the developed countries have been advanced to the present stage, chiefly because the infrastructural elements necessary for planned breeding programmes such as intensive performance recording and A.I. are available. The recent advances have also been made in population genetics and statistics which have made it possible to develop genetic improvement schemes applicable on a national scale. In contrast, infrastructural elements for national breeding programmes are lacking or are inadequate in most parts of the tropics.

The quickest way to improve the productivity of commercial cattle in the tropics is to exploit hybrid vigour through systematic crossbreeding (Koger, 1963). There are several reasons for using crossbreeding in the tropics, apart from